Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1303271**	Page	: 1 of 8
Amendment	: **1**		
Client	: **SHOALHAVEN CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Mr David Hojem	Contact	: Glenn Davies
Address	: PO Box 42 Nowra NSW 2541	Address	: 99 Kenny Street, Wollongong 2500 Unit 4 / 13 Geary Place, PO Box 3105, North Nowra 2541 AUSTRALIA
E-mail	: hojemd@shoalhaven.nsw.gov.au	E-mail	: glenn.davies@alsglobal.com
Telephone	: 02 4429 3406	Telephone	: 02 4225 3125
Facsimile	: ----	Facsimile	: 02 4225 3128
Project	: West Nowra Landfill	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 15425.16780		
C-O-C number	: ----	Date Samples Received	: 20-NOV-2013
Sampler	: ----	Issue Date	: 30-DEC-2013
Site	: ----		
		No. of samples received	: 23
Quote number	: ----	No. of samples analysed	: 23

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **BH 11, BH 15, MW 3a, BH 1 - A sample was not able to be taken for analysis due to the well being Dry.**
- **EA015 : TDS may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**
- **EN055- Ionic Balance out of acceptable limits for sample BH 13 due to analytes not quantified in this report.**

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Raymond Commodor	Instrument Chemist	Sydney Inorganics

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: SW 1 Drain	SW2 Creek Bridge	SW3 Creek	BH 2	BH 3
			Client sampling date / time	20-NOV-2013 11:45	20-NOV-2013 09:30	20-NOV-2013 12:30	20-NOV-2013 12:35	20-NOV-2013 12:40
				EW1303271-001	EW1303271-002	EW1303271-003	EW1303271-004	EW1303271-005
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	624	121	1020	2000	229
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	86	11	<1	9	<1
Total Alkalinity as CaCO3	----	1	mg/L	86	11	<1	9	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	64	6	26	26	52
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	277	14	575	650	58
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	35	3	13	24	<1
Magnesium	7439-95-4	1	mg/L	20	2	29	31	4
Sodium	7440-23-5	1	mg/L	156	11	274	313	52
Potassium	7440-09-7	1	mg/L	24	3	7	3	<1
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.01	0.06	0.19	0.02
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	10.9	0.74	16.8	19.1	2.72
Total Cations	----	0.01	meq/L	10.8	0.87	17.0	17.4	2.59
Ionic Balance	----	0.01	%	0.34	----	----	4.44	----
Ionic Balance	----	0.01	%	----	----	0.74	----	----
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	6.3	7.5	4.4	4.8	4.2
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1150	114	1800	----	----
Dissolved Oxygen	----	0.01	mg/L	1.35	1.05	1.15	----	----
Standing Water Level	----	0.01	m AHD	----	----	----	30.5	29.9
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	15	24	19	85	6
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	5	5	4	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	BH 4A	BH 5	BH 6	BH 7	BH 10
				Client sampling date / time	20-NOV-2013 12:55	20-NOV-2013 11:35	20-NOV-2013 11:10	20-NOV-2013 11:00	20-NOV-2013 10:45
					EW1303271-006	EW1303271-007	EW1303271-008	EW1303271-009	EW1303271-010
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	1	mg/L		158	2270	928	423	452
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	<1	<1	8	32
Total Alkalinity as CaCO3	----	1	mg/L		<1	<1	<1	8	32
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		33	39	39	36	7
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		34	1120	528	192	133
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		1	27	10	16	6
Magnesium	7439-95-4	1	mg/L		4	57	21	13	6
Sodium	7440-23-5	1	mg/L		20	619	307	102	70
Potassium	7440-09-7	1	mg/L		<1	4	3	3	1
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.15	0.93	0.09	0.07	3.51
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		1.65	32.4	15.7	6.33	4.54
Total Cations	----	0.01	meq/L		1.46	33.1	15.7	6.38	4.40
Ionic Balance	----	0.01	%		----	0.99	0.17	0.44	----
Ionic Balance	----	0.01	%		----	----	----	----	1.53
EN67 PK: Field Tests									
pH	----	0.1	pH Unit		4.0	4.6	4.6	5.5	5.5
Standing Water Level	----	0.01	m AHD		31.1	28.4	30.4	30.0	33.8
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		8	15	5	10	23

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BH 11	BH 12A	BH 13	BH 14	BH 15
				Client sampling date / time	20-NOV-2013 11:25	20-NOV-2013 11:15	20-NOV-2013 12:00	20-NOV-2013 14:00	20-NOV-2013 13:40
Compound	CAS Number	LOR	Unit		EW1303271-011	EW1303271-012	EW1303271-013	EW1303271-014	EW1303271-015
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	1	mg/L		----	1620	1630	759	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		----	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		----	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		----	<1	13	<1	----
Total Alkalinity as CaCO3	----	1	mg/L		----	<1	13	<1	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		----	34	6	59	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		----	804	894	414	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		----	39	5	4	----
Magnesium	7439-95-4	1	mg/L		----	44	14	18	----
Sodium	7440-23-5	1	mg/L		----	431	386	214	----
Potassium	7440-09-7	1	mg/L		----	<1	<1	1	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	0.07	0.24	0.03	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		----	23.4	25.6	12.9	----
Total Cations	----	0.01	meq/L		----	24.3	32.7	13.0	----
Ionic Balance	----	0.01	%		----	1.93	----	----	----
Ionic Balance	----	0.01	%		----	----	12.2	0.37	----
EN67 PK: Field Tests									
pH	----	0.1	pH Unit		----	4.5	5.1	4.0	----
Field Observations	----	0.01	--		DRY	----	----	----	DRY
Standing Water Level	----	0.01	m AHD		----	29.8	33.4	36.7	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	12	17	10	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	MW 1D	MW 1S	MW 2	MW 3A	MW 4
				Client sampling date / time	20-NOV-2013 10:15	20-NOV-2013 10:05	20-NOV-2013 10:30	20-NOV-2013 09:50	20-NOV-2013 13:30
					EW1303271-016	EW1303271-017	EW1303271-018	EW1303271-019	EW1303271-020
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	<1	**56**	----	<1
Total Alkalinity as CaCO3	----	1	mg/L		<1	<1	**56**	----	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**7**	**10**	**13**	----	**32**
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		**222**	**220**	**514**	----	**703**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**11**	**7**	**34**	----	**2**
Magnesium	7439-95-4	1	mg/L		**13**	**12**	**28**	----	**24**
Sodium	7440-23-5	1	mg/L		**104**	**107**	**270**	----	**412**
Potassium	7440-09-7	1	mg/L		<1	<1	<1	----	<1
EG020F: Dissolved Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L		**0.10**	**1.96**	**14.7**	----	**49.1**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.02**	<0.01	**0.05**	----	**0.34**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		<0.01	<0.01	<0.01	----	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	**0.02**	<0.01	----	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	**0.02**	<0.01	----	<0.01
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**6.41**	**6.41**	**15.9**	----	**20.5**
Total Cations	----	0.01	meq/L		**6.33**	**6.28**	**15.8**	----	**20.0**
Ionic Balance	----	0.01	%		----	----	**0.46**	----	**1.26**
Ionic Balance	----	0.01	%		**0.59**	**1.02**	----	----	----
EN67 PK: Field Tests									
pH	----	0.1	pH Unit		**3.8**	**4.1**	**5.2**	----	**4.4**
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**681**	**679**	**1710**	----	**2260**
Field Observations	----	0.01	--		----	----	----	**DRY**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 2	MW 3A	MW 4
				Client sampling date / time	20-NOV-2013 10:15	20-NOV-2013 10:05	20-NOV-2013 10:30	20-NOV-2013 09:50	20-NOV-2013 13:30
Compound	CAS Number	LOR	Unit		EW1303271-016	EW1303271-017	EW1303271-018	EW1303271-019	EW1303271-020
EN67 PK: Field Tests - Continued									
Standing Water Level	----	0.01	m AHD		38.3	38.2	36.3	----	35.0
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		7	6	11	----	8
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		<2	<2	6	----	7
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		<0.05	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Duplicate	Blank	BH 1	----	----
				Client sampling date / time	20-NOV-2013 11:15	20-NOV-2013 12:05	20-NOV-2013 12:10	----	----
Compound	CAS Number	LOR	Unit		EW1303271-021	EW1303271-022	EW1303271-023	----	----
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	1	mg/L		**949**	----	----	----	----
Total Dissolved Solids @180°C	----	1	mg/L		----	<1	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	<1	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		<1	<1	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**39**	<1	----	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		**536**	<1	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**11**	<1	----	----	----
Magnesium	7439-95-4	1	mg/L		**21**	<1	----	----	----
Sodium	7440-23-5	1	mg/L		**304**	<1	----	----	----
Potassium	7440-09-7	1	mg/L		**3**	<1	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.08**	<0.01	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**15.9**	<0.01	----	----	----
Total Cations	----	0.01	meq/L		**15.6**	<0.01	----	----	----
Ionic Balance	----	0.01	%		**1.14**	----	----	----	----
EN67 PK: Field Tests									
pH	----	0.1	pH Unit		**4.6**	**6.9**	----	----	----
Field Observations	----	0.01	--		----	----	**DRY**	----	----
Standing Water Level	----	0.01	m AHD		**29.8**	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**5**	<1	----	----	----